HIGHER

8.5 The Nth Term of a Quadratic Sequence: 1-hour Pack

Total Marks

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 The quadratic sequence begins 3, 8, 15, 24, 35. Find an expression for the nth term in the form $an^2 + bn + c$.

(Total for Question 1 is 3 marks)

2 The nth term of a sequence is $n^2 + 4n + 3$. Find the value of n for which the term is 63.

(Total for Question 2 is 3 marks)

3 Find all integer values of n for which $n^2 - 3n + 2 = 0$.

(Total for Question 3 is 2 marks)

© Revision Library | revisionlibrary.co.uk

4 The nth term of a sequence is $n^2 - n + 5$.

(a) Work out the 1st and 2nd terms of the sequence. **(2)**

.....

(b) Work out the 20th term of the sequence. **(2)**

.....

(Total for Question 4 is 4 marks)

---

5 A quadratic sequence has constant second difference 8. Its 3rd term is 24 and its 5th term is 60. Find an expression for the nth term.

(Total for Question 5 is 3 marks)

---

6 The sequence begins 10, 24, 44, 70, 102.

(a) Find an expression for the nth term. **(2)**

.....

(b) Hence find the value of n for which the term is 70. **(2)**

.....

(Total for Question 6 is 4 marks)

© Revision Library | revisionlibrary.co.uk

7 A quadratic sequence has nth term $n^2 - 7n + 15$.

(a) Work out the 5th term of the sequence. **(1)**

.....

(b) Find the smallest value in the sequence, and state the term number(s) at which it occurs. **(3)**

.....

(Total for Question 7 is 4 marks)

---

8 The nth term of a sequence is $6n^2 + 8n - 6$. Find and simplify an expression, in terms of n, for the difference between the (n + 1)th term and the nth term.

(Total for Question 8 is 3 marks)

---

9 The first five terms of a quadratic sequence are 15, 17, 15, 9, -1. Find an expression, in terms of n, for the nth term of the sequence.

(Total for Question 9 is 4 marks)

© Revision Library | revisionlibrary.co.uk

10 The first four terms of a quadratic sequence are 19, 34, 55, 82. Find the nth term of the sequence and hence work out the 24th term.

(Total for Question 10 is 5 marks)

---

11 The nth term of a sequence is $-n^2 - 6n$. Is -137 a term of this sequence? You must show your working.

(Total for Question 11 is 3 marks)

---

12 The nth term of a quadratic sequence is given by $an^2 + bn + c$, where a, b and c are constants. The 2nd term of the sequence is 7, the 4th term is 25, and the 6th term is 59. Find the values of a, b and c.

(Total for Question 12 is 5 marks)

---

13 A quadratic sequence has nth term $n^2 - 6n + 12$. Tomasz says, 'Some term in this sequence is equal to 2.' Show that Tomasz is wrong.

(Total for Question 13 is 3 marks)

© Revision Library | revisionlibrary.co.uk

Mark scheme · 8.5 The Nth Term of a Quadratic Sequence: 1-hour Pack

Question 1

second difference = 2 so a = 1 (2a = 2) oe	**M1**
use n = 1 and n = 2 to form linear equations and solve for b and c (eg 1 + b + c = 3 and 4 + 2b + c = 8) oe	**M1**
nth term = $n^2 + 2n$ cao	**A1**

Answer: $n^2 + 2n$

Question 2

form equation $n^2 + 4n + 3 = 63$ oe	**M1**
rearrange and factorise to (n + 10)(n - 6) = 0 or equivalent method	**M1**
n = 6 cao (positive integer solution)	**A1**

Answer: 6

Question 3

factorise to (n - 1)(n - 2) = 0 or equivalent	**M1**
n = 1 or n = 2 cao	**A1**

Answer: n = 1 or n = 2

Question 4

(a) 1st term = 5	**B1**
(a) 2nd term = 7	**B1**

(a) Answer: 5, 7

(b) substituting n=20 into n^2-n+5	**M1**
(b) 385 cao	**A1**

(b) Answer: 385

Question 5

second difference = 8 so a = 4 (2a = 8) oe	**M1**
use T3 and T5 to form two linear equations and solve for b and c (eg 36 + 3b + c = 24 and 100 + 5b + c = 60) oe	**M1**
nth term = $4n^2 - 14n + 30$ cao	**A1**

Answer: $4n^2 - 14n + 30$

Question 6

(a) second differences 14, 20, 26 so second difference = 6 and a = 3 (2a = 6) oe	**M1**
(a) nth term = $3n^2 + 5n + 2$ cao	**A1**

(a) Answer: $3n^2 + 5n + 2$

(b) set $3n^2 + 5n + 2 = 70$ and rearrange to $3n^2 + 5n - 68 = 0$ oe	**M1**
(b) n = 4 cao	**A1**

(b) Answer: 4

Question 7

(a) 5 cao	**B1**

(a) Answer: 5

(b) finding the vertex of the quadratic at n=3.5 using n=-b/(2a) (or an equivalent method)	**M1**
(b) evaluating the sequence at n=3 and n=4 (both give 3)	**M1**
(b) smallest value is 3, occurring at both n=3 and n=4	**A1**

(b) Answer: Smallest value is 3, at n=3 and n=4

Question 8

writes the (n + 1)th term as $6(n + 1)^2 + ...$	**M1**
expands and subtracts the nth term	**M1**
12n + 14	**A1**

Answer: 12n + 14

Question 9

first differences 2, -2, -6, -10	**M1**
second difference -4, so a = -2	**M1**
subtracts $-2n^2$ from the terms to get a linear sequence	**M1**
$-2n^2 + 8n + 9$	**A1**

Answer: $-2n^2 + 8n + 9$

Question 10

first differences 15, 21, 27	**M1**
second difference 6, so a = 3	**M1**
subtracts the quadratic part to find the linear part	**M1**
$3n^2 + 6n + 10$	**A1**
1882	**A1**

Answer: $3n^2 + 6n + 10$; term 24 = 1882

Question 11

$-n^2 - 6n = -137$	**M1**
tests values of n or solves the quadratic	**M1**
No with supporting working	**A1**

Answer: No

Question 12

forming three equations: 4a+2b+c=7, 16a+4b+c=25, 36a+6b+c=59	**M1**
eliminating c to obtain two equations in a and b (e.g. 6a+b=9 and 10a+b=17)	**M1**
solving simultaneously to find a = 2	**M1**
b = -3	**A1**
c = 5	**A1**

Answer: a = 2, b = -3, c = 5

Question 13

forming the equation $n^2 - 6n + 12 = 2$, i.e. $n^2 - 6n + 10 = 0$	**M1**
calculating the discriminant: $b^2 - 4ac = 36 - 40 = -4$	**M1**
cso: since the discriminant is negative there are no real solutions for n, so Tomasz is wrong	**A1**

Answer: Tomasz is wrong; no real value of n satisfies the equation

© Revision Library | revisionlibrary.co.uk